Coastal Observation Technology System Project Summary – 2004

Project Name/Title: Coastal Ocean Research and Monitoring Program (CORMP)

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Recipient Institution: University of North Carolina at Wilmington (UNCW)

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Brief Project Summary: CORMP is an integrated, regional coastal ocean observing system (RCOOS) program that will operate under the emerging Southeast Coastal Ocean Observing Regional Association of the Integrated Ocean Observing System (IOOS). Managed by the University of North Carolina at Wilmington, CORMP provides sustained observational and research data for the region's oceanographic, marine weather, marine fisheries, and coastal resource management users. Observations in the coastal ocean extending from just north of Cape Lookout to the North Carolina/South Carolina state line are provided by a combination of fixed stations providing high temporal resolution and regular transects and station sampling providing higher spatial resolution, particularly in the fisheries-critical Cape Fear River plume region. Data collected include surface, subsurface, and seafloor physical, marine biological, and fisheries parameters, benthic boundary layer processes, and sediment transport.

Beginning in 2004, oceanographic stations will be converted to real-time, and real-time surface meteorological data will also be collected. CORMP is also a partner in the regional modeling effort to improve coastal storm surge flooding predictions and marine ecological and fisheries models. Significant regional user partnerships include NOAA's National Weather Service and local Forecast Office, the U.S. Marine Corps Base at Camp Lejeune, and local school districts, with emerging partnerships with the State Ports Authority Wilmington, the Military Ocean Terminal at Sunny Point, and the U.S. Coast Guard. Agreements are in place for the evaluation and use of CORMP data and research in the improvement of coastal rip tide prediction, sediment transport and beach renourishment planning, safety at sea, blue crab fisheries management (the state's largest value fishery), and coastal storm surge forecast improvement. CORMP, a member of the Coastal Observation Technology System (COTS), is funded through NOAA's Coastal Services Center.

Accomplishments to Date:

- CORMP has established an agreement with the U.S. Marine Corps at Camp Lejeune for a joint (50:50 cost sharing basis) deployment and operation of a near-coast mooring in Onslow Bay. The mooring, to be procured through NOAA's National Data Buoy Center, will provide the Marine Corps needed data on meteorological and oceanographic conditions during area training operations, as well as fill an observation gap identified by NOAA's National Weather Service in its coastal waters forecast services.
- CORMP has established an agreement with the National Weather Service Weather Forecast Office (WFO) Wilmington for the quality review and use of CORMP's new surface meteorological moorings now being procured. WFO Wilmington will assist in the quality assurance review of the data, and explore the use of these new data in the WFO's coastal and beach rip current warnings, marine forecast, current weather analysis, and NOAA All Hazard Radio broadcast operations for the area.
- The CORMP high-resolution observing array captured the passage of Hurricane Isabel across the region in September 2003, documenting for the first time some of the first direct measures of hurricane impact on the bottom boundary layer at midcontinental shelf locations in the southeastern U.S. Isabel was shown to cause significant loss of benthic microalgal biomass (up to 40 percent) and extensive sea bed and bottom sediment reworking out to 27 miles offshore. Such biomass loss and sediment disturbances adversely affect tropic relationships in the coastal ecosystem by redistributing benthic primary producers and benthic infauna that support commercially and recreationally important fisheries on the shelf. These results are described in greater detail in a CORMP-sponsored manuscript that has been accepted for publication.
- CORMP has established an education and outreach program utilizing the UNCW-developed River Run and Ocean View programs, enabling primary and secondary schoolteachers to use CORMP. Up to 200 teachers, 100 pre-service teachers, and 500 students are expected to make use of this new outreach service this fall. The Oceanview and Riverview Web sites are at *www.uncw.edu/oceanview* and *www.uncw.edu/riverview/* respectively.
- Assessing temporal and spatial patterns of larval abundance is critical to understanding population dynamics of marine species but is often impossible because of difficulties in identifying planktonic larvae to the species level. Through a partnership with North Carolina Sea Grant, CORMP has developed an efficient multiplex Polymerase Chain Reaction (PCR) assay (a standard technique for making billions of copies of a particular bit of DNA) that can accurately identify (and distinguish) blue crab (*Callinectes* spp.) larvae. This assay is being implemented as part of the CORMP fisheries program in an effort to better understand recruitment variation of the commercially important *C. sapidus*. CORMP has also developed a PCR/RFLP (Restriction Fragment Length Polymorphism) assay that will be used to distinguish three sympatric species of kingfish (*Menticirrhus* spp.) larvae. (RFLP refers to a technique of cutting up DNA. Enzymes specific to a particular sequence of DNA will cut DNA any time

that sequence occurs. For example, the enzyme RSA I cuts DNA every time it finds the sequence GTAC.)

- Work supported by both the North Carolina Division of Marine Fisheries (DMF) and CORMP has confirmed the likely importance of the Cape Fear River plume as an important habitat for blue crabs, North Carolina's highest value commercial fishery. DMF is incorporating the new data and findings into the state's management models, and these findings have been used in the recent revision of the division's North Carolina Blue Crab Management Plan.
- Data from CORMP observations of infaunal biomass and benthic microalgal biomass have been provided to the ECOPATH modeling effort sponsored by the South Atlantic Fisheries Management Council. This modeling effort is intended to predict fisheries yields and sustainable fishing levels in the South Atlantic Bight.
- CORMP data are now being provided to the North Carolina Division of Marine Fisheries for use in the state's Coastal Habitat Protection Plans for soft-bottom communities. CORMP now comprises the principal source of benthic primary producer data for this effort. Habitat protection plans are important for use in evaluating proposed dredge material disposal, mineral extraction activities, and seabed construction activities by the North Carolina Division of Coastal Management, the EPA, the Army Corps of Engineers, the National Marine Fisheries Service, and the Minerals Management Service.
- In response to an unsolicited request by the Nature Conservancy, CORMP data in the Cape Fear River Plume area were delivered for use in the conservancy's national initiative to identify critical offshore and coastal habitats that are to be targeted for habitat conservation and focused management efforts. The conservancy noted that CORMP's scientific-quality, high-resolution data were indispensable in their work.
- CORMP is now working with the North Carolina State Veterinarian's Office, which is investigating coastal impacts of ocean dumping of animal carcasses in the event of mass mortalities from natural disaster or agro-terrorism. This work is sponsored by the U.S. Departments of Agriculture and Homeland Security. At issue are nutrient and pathogen loading to coastal ocean ecosystems, flow patterns and dispersal of materials, and decomposition rates and effects in different oceanic disposal scenarios.

Current Year (2004) Objectives:

- Successfully establish series of real-time moorings with subsurface and surface instrumentation in Raleigh, Onslow. and Long Bays.
- Instrument two commercial fishing piers with subsurface and surface sensors that will provide detailed data on wave spectra and water conditions along the beach.
- Transition the Cape Fear River Estuarine (CFRE) modeling system from a research model into a provisionally operational quality model that can be used by emergency managers for better storm surge predictions.
- Begin development of a water quality model for the Cape Fear River Estuarine (CFRE) system that will be used by fisheries managers, beach renourishment managers, and local public health officials.

- Provide operationally useful information, based on defined research needs, on the state of living marine resources.
- Implement CORMP data management system in cooperation with Caro-COOPS and SEA-COOS.
- Expand vigorous outreach and educational program to include K-12 teachers, fisheries managers, port and military facilities, and homeland security managers.

Partners:

- Caro-COOPS of the University of South Carolina (Dr. Madilyn Fletcher)
- Sea-COOS Associate Member
- North Carolina State University (Dr. Lian Xie and Dr. Len Peitrafesa)
- National Weather Service and the Wilmington Weather Forecast Office
- U.S. Marine Corps Base at Camp Lejeune
- Dr. George Voulgaris and Dr. Dennis Allen, University of South Carolina